The BC Carbon Tax: Consumer Response to an Environmental Gasoline Tax

By
Jean-Thomas Bernard
Grant Guenther
and
Maral Kichian
University of Ottawa
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Order of Presentation

- Introduction
- I. Previous Studies
- II. Data
- III. Econometric models and results
- Conclusion
Introduction

I. The B.C. Carbon Tax
   — The level: 10$/ton of CO$_2$ (July 2008) to 30$ (July 2012).
   — Added 6.67¢/litre.
   — Revenue neutral.
   — Drew a lot of attention, rather well received.

II. Research objective:

   To measure the consumer response to the new per unit gasoline tax.

**Interest over time**

The number 100 represents the peak search interest.
I. Previous Studies


II. Data

Figure 1. Monthly Gasoline Sales per capita (litres)
Figure 2: Real Monthly GDP per capita
Figure 3: Real Gasoline Price (Cents per litre)
III. Econometric Models and Results

Model 1:

\[ Y_t = \beta + \delta Y_{t-1} + \gamma \Delta GDP_t + \alpha P_t + \varepsilon \]

\(Y_t\) = monthly per capita gasoline sales.

\(\Delta GDP_t\) = change in monthly per capita real GDP.

\(P_t\) = real gasoline price.

Model 2:

\[ Y_t = \beta + \delta Y_{t-1} + \gamma \Delta GDP_t + \alpha_1 \Delta P_{1,t} + \alpha_2 P_{2,t} + \varepsilon \]

\(Y_t\) = monthly per capita gasoline sales.

\(\Delta GDP_t\) = change in monthly per capita real GDP.

\(\Delta P_{1,t}\) = change in real gasoline price net of real excise taxes.

\(P_{2,t}\) = excise tax inclusive carbon tax.

Model 3:

\[ Y_t = \beta + \delta Y_{t-1} + \gamma \Delta GDP_t + \alpha_1 \Delta P_{1,t} + \alpha_2 P_{2,t} + \alpha_3 P_{3,t} + \varepsilon \]

\(Y_t\) = monthly per capita gasoline sales.

\(\Delta GDP_t\) = change in monthly per capita real GDP.

\(\Delta P_{1,t}\) = change in real gasoline price net of real excise taxes.

\(P_{2,t}\) = real excise taxes net of carbon tax.

\(P_{3,t}\) = real carbon tax.

Model 4:

\[ Y_t = \beta + \gamma \Delta GDP_t + \alpha_1 P_t + \theta D_t + \varepsilon_t \]

\(D_t\) = introduction effect (demand shift).
<table>
<thead>
<tr>
<th>Model</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intercept</strong></td>
<td>71.33</td>
<td>98.12</td>
<td>92.55</td>
<td>94.77</td>
</tr>
<tr>
<td></td>
<td>(7.19)</td>
<td>(9.09)</td>
<td>(9.01)</td>
<td>(1.01)</td>
</tr>
<tr>
<td><strong>Lag consumption</strong></td>
<td>0.265</td>
<td>0.127</td>
<td>0.056</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(0.074)</td>
<td>(0.076)</td>
<td>(0.078)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Δ in GDP</strong></td>
<td>0.135</td>
<td>0.217</td>
<td>0.152</td>
<td>0.083</td>
</tr>
<tr>
<td></td>
<td>(0.049)</td>
<td>(0.050)</td>
<td>(0.053)</td>
<td>(0.046)</td>
</tr>
<tr>
<td><strong>Total price</strong></td>
<td>-0.093</td>
<td>-</td>
<td>-</td>
<td>-0.083</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>-</td>
<td>-</td>
<td>(0.012)</td>
</tr>
<tr>
<td><strong>Δ in excise tax exclusive price</strong></td>
<td>-</td>
<td>-0.064</td>
<td>-0.073</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>(0.015)</td>
<td>(0.015)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Excise and carbon tax</strong></td>
<td>-</td>
<td>-0.677</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>(0.132)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Excise tax</strong></td>
<td>-</td>
<td>-</td>
<td>-0.0215</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>(0.194)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Carbon tax</strong></td>
<td>-</td>
<td>-</td>
<td>-1.214</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>(0.212)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Introduction effect</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-4.15</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(0.60)</td>
</tr>
<tr>
<td><strong>R-squared</strong></td>
<td>0.50</td>
<td>0.56</td>
<td>0.58</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Note: Standard errors are in parentheses.
Conclusion

When the tax is completely phased in, we have:

— Monthly reduction of 4.6 litres per capita.
— Annual reduction of 248,000,000 litres or 5.3% of 2011 gasoline sales.
— Annual reduction of 580,000 tons of CO$_2$
— 1.0% of total GHG emissions in 2010: 62 million tons.